TITLE: PRESSURE DROP GENERATION IN CIGARETTE FILTERS

AUTHOR: G. T. Rasmussen*

AFFILIATION: Eastman Kodak Company, Eastman Chemicals Division,
Research Laboratories, Kingsport, TN 37662

ABSTRACT: Flow field theories describing pressure drop generation in cellulose acetate filters have been examined by using a large collection of tow capability data. Alternative formulations of the model considered the use of different flow fields, crimp shapes, and normalization methods. Both cell model flow fields (Happel and Kuwabara) and Brinkman flow fields were studied, and five different assumed crimp shapes were examined. Selection of the most useful form of the model was based on the agreement between theoretical estimates and observed rod pressure drop data, given specific assumptions about the uniformity of the fiber distribution. The observations against which the theories were tested included nearly 1500 capability curves representing over 90 different tow items. Differences between models using the alternative crimp shapes and normalization methods were generally small compared to differences between models with different flow fields. The theoretical model best fitting the data, given a constant fiber distribution uniformity, used a Kuwabara flow field and an elliptical crimp shape. Effectiveness of this model was independent of both the blooming process/plugmaker combination used and the operating speed. The model provides a useful tool for the study of pressure drop generation in fibrous filters.

REVIEW: In this work, variations in the flow-field term of a general model of pressure drop generation in cigarette filters were examined in detail. The model formulation was selected on the basis of agreement with empirical data. The theory is extremely general; however, it necessitates an estimate of the nonuniformity of the fiber distribution. This theoretical model for pressure drop improves understanding of cigarette filter performance and increases effectiveness in filter design.

-Reviewed by E. Stagg, III